

# INTERNATIONAL STANDARD



**Printed electronics –  
Part 503-3: Quality assessment – Measuring method of contact resistance for the  
printed thin film transistor – Transfer length method**



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## PRINTED ELECTRONICS –

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## INTRODUCTION

In a thin film transistor (TFT), contact resistance occurs at the contacting interfaces at the gate, source and drain electrodes, and the TFT semiconductor layer. While contact resistance is negligible at the gate electrode, it reduces the effective voltage applied to the source and drain electrodes. Therefore, the evaluation of the contact resistance can provide important insights related to the performance characteristics of printed TFTs. Especially for printed electronics, the contact resistance varies with the employed materials, printing processes and the time series variation because the interface is made of simple contact obtained by additive manufacturing instead of a junction obtained by vacuum deposition and etching processes. Thus, the performance of printed TFTs is greatly influenced by the value of contact resistance. A change of the contact resistance is therefore considered to be a key factor for a proper interpretation of performance, lifetime, and reliability of a printed TFT.

To determine the contact resistance, several techniques, including but not limited to two-terminal contact method, four-terminal contact method, six-terminal contact method, transfer length method, and scanning probe potentiometer technique can be used. The transfer length method (TLM) in particular has a practical advantage because the supplier can test discrete devices, which have the same structure as the original printed TFT, on a common substrate simultaneously. Furthermore, the TLM is cost-effective because the user can measure the apparent contact resistance without using expensive equipment. Therefore, by using TLM, the supplier and the user can exchange the important parameter of the TFT that is contact resistance for reliability assessment as a part of their supply chain service.